



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/915,396	07/27/2001	Atsumi Yamaguchi	211909US-2 CIP	7908

22850 7590 07/24/2003

OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER

DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
----------	--------------

1765

DATE MAILED: 07/24/2003

11

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-11

Office Action Summary	Application No. 09/915,396	Applicant(s) YAMAGUCHI ET AL.	
	Examiner DuyVu n Deo	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14-18 is/are allowed.
- 6) ☒ Claim(s) 1-4 and 8-11 is/are rejected.
- 7) ☒ Claim(s) 5-7, 12 and 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 24 June 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>7,8</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 1, 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Oh et al. (US 6,200,903).

Oh describes a method for etching a semiconductor device comprising: forming an etching object, polysilicon layer, on the substrate; forming a resist film having a thickness of 650 nm (claimed first resist film with a predetermined thickness) on the etching object; patterning the resist film into a pattern; performing ion implantation at an tilted angle (claimed obliquely) having dose of 1E15 to 5E16 ions/cm² (claimed predetermined ion implantation set) into the resist pattern to reduce the resist thickness by about 30-40% (claimed a second predetermined thickness); etching the polysilicon layer using the resist film as a mask (col. 3, line 13-38; line 65-68). Since Oh performs the same process, ion implantation using Ar, which is the same as that of claimed invention. Therefore, his resist thickness would also be contracted by the ion implantation process as that of claimed invention.

Art Unit: 1765

Column 3, line 19 discloses a resist thickness of 650nm (or 6500 angstroms), which is between the workable resist thickness of 585nm and 880 nm, disclosed in the pages 28 and 32 of specification. Also, column 4, line 21-34, describes by applying ion implantation, the thickness of the resist can be less by about 30-40% than for the conventional case to provide an easy photolithography process. Since the critical dimension shift depends on the second thickness and Oh's second thickness is predetermined to be at 30-40% less than the first thickness, his second thickness would have a predetermined critical dimension shift that it corresponds to because he describes the same ion implantation step and his thickness is within the workable thickness as described by the specification.

3. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Kobayashi (JP 4127518A).

Kobayashi describes a method etching a semiconductor device comprising: forming an etching object, poly layer, on the substrate; forming and patterning a resist on the poly layer; performing ion-implantation having dose of 1×10^{14} ions/cm² or more (claimed predetermined ion implantation level) into the resist pattern, and therefore reducing the resist thickness; etching the poly layer to form a work pattern (pages 4-5 of the translation; fig. 1). The resist thickness is reduced from 0.6um (600nm) (claimed first predetermined thickness) to 0.45 um (450 nm) (claimed second predetermined thickness) (page 9, embodiment 2; claim 2). Since the critical dimension shift depends on the second thickness and Kobayashi's first thickness is within workable range of 880 nm of the embodiment 5 according to the invention and the second

Art Unit: 1765

thickness is predetermined to be less than the first thickness, his second thickness would have a predetermined critical dimension shift that it corresponds to.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh as applied to claim 1 above, and further in view of applicant's admitted prior art.

Referring to claim 2, forming insulating film including silicon nitride is requisite in the conventional etching of the wiring pattern forming method as described in page 3, line 13 of specification. The silicon nitride (claimed ion prevention film) would further prevent ion implanted into the etching object since it covers the etching object.

Referring to claim 3, forming the silicon nitride by plasma CVD is a technique that is well known to one skilled in the art at the time of the invention (please see cited Wolf et al. below).

6. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh or Kobayashi as applied to claim 1 above, and further in view of Bell (US 5,767,018).

Referring to claims 2-4, using materials such as nitride, oxynitride, or organic ARC (claimed ion prevention films) is well known to one skill in the in fabricating of semiconductor process as anti-reflective coating (ARC) as shown here by Bell. They are deposited by CVD (col. 1, line 11-35, line 55-65; col. 7, line 41-49). It would have been obvious for one skill in the

Art Unit: 1765

art at the time of the invention to modify Oh's method in view of Bell because Bell teaches that these materials would minimize notches caused by reflections during the photolithographic techniques (col. 1, line 24-26).

7. Claims 9, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh as applied to claim 1 above, and further in view of Geusic et al. (US 6,518,615).

Unlike claimed invention, Oh doesn't describe the etching object (or polysilicon) has asperities on its surface. Geusic describes a method for forming memory cells where he teaches to the polysilicon has pores on its surface (claimed asperities on etching object surface) (col. 1, line 51-67). It would have been obvious for one skilled in the art to modify Oh in light of Geusic's teaching of having pores or asperities on the polysilicon surface because they both teach of forming capacitor (Oh: col. 4, line 50, 51; Geusic: col. 1, line 51-52) and the pores would increase the surface area in which it would increase the storage capacity of the capacitor (Geusic: col. 1, line 61-64; Oh: col. 4, line 50-51). Oh further describes impurities may be doped in the polysilicon layer (or etching object) before forming the photoresist (step b) (col. 3, line 16-17). And method for doping the polysilicon layer such as claimed ion implantation is well known to one skilled in the art (please see Wolf et al. cited below).

Referring to claim 10, techniques or steps of forming a pattern on the resist by performing exposure through a reticle and executing development are necessary steps that are well known to one skilled in the art of forming a resist pattern as shown here by Wolf (please see Wolf et al. cited below).

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oh and Geusic as applied to claim 9 above, and further in view of Borodovsky (US 4,529,685).

Art Unit: 1765

Referring to claim 11, above prior art doesn't describe the etching object has a mark for mask alignment on its surface. Borodovsky teaches a method of etching reflective surface such as polysilicon (or etching object) where he teaches the etching object has a mark for mask alignment on its surface (col. 1, lines 14-20, 55-57; col. 2, lines 10-15). It would have been obvious for one skilled in the art at the time of the invention to modify the method of above prior art in light of Borodovsky because he teaches that mark on the etching object would ensure the alignment of subsequent mask pattern placed thereon (col. 1, line 55-57; col. 2, line 10-15).

Allowable Subject Matter

9. Claims 5, 6, 12-18 remained allowable.

10. Wolf et al. (Silicon Processing for the VLSI, vol. 1, pages 181-182, 191-195, 407-408) is cited to show prior art.

Claim Rejections - 35 USC § 112

11. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

12. Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that

Art Unit: 1765

the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicant has not shown where in the specification teaching of the first predetermined thickness and the predetermined ion implantation level are set so that the second predetermined thickness corresponds to a predetermined critical dimension shift in the work pattern.

13. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

14. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant does not define what the predetermined ion implantation level set, first predetermined thickness, second predetermined thickness, predetermined critical dimension shift in the work pattern are. How one skill in the art would know what applicant's predetermined values are.

Response to Arguments

15. Referring to applicant's argument that Oh doesn't suggest the first predetermined thickness, ion implantation to produce a second predetermined thickness, Oh describes a resist film having a thickness of 650 nm (claimed first resist film with a predetermined thickness), an ion implantation dose of $1E15$ to $5E16$ ions/cm² (claimed predetermined ion implantation set) into the resist pattern to reduce the first resist thickness by about 30-40% (claimed a second predetermined thickness). Same argument to Kobayashi, the first predetermined thickness is 0.6um (600nm), predetermined ion implantation level is at least $1 \times 10E14$ ions/cm² or more, and the second predetermined thickness is 0.45 um (450 nm).

Art Unit: 1765

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., Oh's second thickness of about 390-455 nm is not at 344 nm) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Oh's first predetermined thickness is 650nm (col. 3, line 19), which is between the workable resist thickness of 585nm and 880 nm. Since the critical dimension shift depends on the second thickness and Oh's second thickness is predetermined to be at 30-40% less than the first thickness, his second thickness would have a predetermined critical dimension shift that it corresponds to. Same argument applied to Kobayashi.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Referring to claims 2 and 4, applicant has not traversed that forming insulating film including silicon nitride is requisite in the conventional etching of the wiring pattern forming method as described in page 3, line 13 of specification

In response to applicant's argument that the admitted prior art and Bell do not teaching the ARC layers are for prevention of ion implantation, the fact that applicant has recognized

Art Unit: 1765

another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).


Conclusion

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD
July 22, 2003


BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700